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## NOTICE OF ALLOWANCE AND FEE(S) DUE

21005 7590 06/21/2010

HAMILTON, BROOK, SMITH & REYNOLDS, P.C.  
530 VIRGINIA ROAD  
P.O. BOX 9133  
CONCORD, MA 01742-9133

EXAMINER

HU, HENRY S

ART UNIT

PAPER NUMBER

1796

DATE MAILED: 06/21/2010

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/566,135

01/27/2006

Gordon Calundann

3799.1014-000

1711

TITLE OF INVENTION: PROTON-CONDUCTING MEMBRANE AND USE THEREOF

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	NO	\$1510	\$300	\$0	\$1810	09/21/2010

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

### HOW TO REPLY TO THIS NOTICE:

#### I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

# **PART B - FEE(S) TRANSMITTAL**

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE  
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**INSTRUCTIONS:** This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

21005 7590 06/21/2010

**HAMILTON, BROOK, SMITH & REYNOLDS, P.C.**  
530 VIRGINIA ROAD  
P.O. BOX 9133  
CONCORD, MA 01742-9133

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## **Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/566,135 01/27/2006 Gordon Calundann 3799.1014-000 1711

TITLE OF INVENTION: PROTON-CONDUCTING MEMBRANE AND USE THEREOF

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
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nonprovisional NO \$1510 \$300 \$0 \$1810 09/21/2010

EXAMINER	ART UNIT	CLASS-SUBCLASS
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HU, HENRY S 1796 429-033000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 \_\_\_\_\_
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 \_\_\_\_\_
- 3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies \_\_\_\_\_

4b. Payment of Fee(s); (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature \_\_\_\_\_

Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_

Registration No. \_\_\_\_\_

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/566,135	01/27/2006	Gordon Calundann	3799.1014-000	1711
21005	7590	06/21/2010	EXAMINER	
HAMILTON, BROOK, SMITH & REYNOLDS, P.C. 530 VIRGINIA ROAD P.O. BOX 9133 CONCORD, MA 01742-9133			HU, HENRY S	
			ART UNIT	PAPER NUMBER
			1796	
DATE MAILED: 06/21/2010				

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 537 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 537 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/566,135	CALUNDANN ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	HENRY S. HU	1796	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to Amendment of March 1, 2010.
2. ☒ The allowed claim(s) is/are 1-18, 20-21 and 28-52.
3. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☒ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☒ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br/>Paper No./Mail Date <u>See Continuation Sheet</u></li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____.</li> <li>7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____.</li> </ol> |
|---|---|

Continuation of Attachment(s) 3. Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date: 3-1-2010 and 6-4-2010.

### **EXAMINER'S AMENDMENT**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Attorney **Alice O. Carroll** (registration # 33,542, tel: 978 341-0036) on **June 3, 2010** to cancel non-elected Claims 22-27 as well as to amend Claims 1, 43-45, 48-49 and 52 as following:

#### **Claim**

**Claims 22-27** please cancel Claims 22-27

**Claim 1** at line 9 please replace the phrase of "acid affinity in polyphosphoric acid" with "acid affinity, in polyphosphoric acid"

**Claim 43** at line 9 please replace the phrase of "acid affinity in polyphosphoric acid" with "acid affinity, in polyphosphoric acid"

**Claim 44** at line 9 please replace the phrase of “acid affinity in polyphosphoric acid” with “acid affinity, in polyphosphoric acid”

**Claim 45** at lines 28-29 please replace the phrase of “acid affinity in polyphosphoric acid” with “acid affinity, in polyphosphoric acid”

**Claim 48** at line 8 please replace the phrase of “acid affinity in polyphosphoric acid” with “acid affinity, in polyphosphoric acid”

**Claim 49** at lines 28-29 please replace the phrase of “acid affinity in polyphosphoric acid” with “acid affinity, in polyphosphoric acid”

**Claim 52** at line 9 please replace the phrase of “acid affinity in polyphosphoric acid” with “acid affinity, in polyphosphoric acid”

## DETAILED ACTION

2. This Office Action is in response to **two** things including: (A) **Amendment** and (B) **two** new **IDS**’ (total 6 pages) filed on March 1, 2010 and June 4, 2010, which are in response to Non-Final office action filed on October 30, 2009. With such an amendment along with above Examiner’s Amendment, **Claims 1-3, 7-10, 13-18, 20-21, 43-45, 48-49 and 52 are amended; non-elected Claims 22-27 are cancelled, while new Claims 28-52 are added.** To be

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specific, parent **Claim 1** is joined with six newly added independently Claims 43-45, 48-49 and

52. The support for claim amendment and claim addition is as disclosed on pages **31-32** of

Remarks. Parent Claim 1 is amended in many ways. One way is to use the language

“obtained” so as to overcome 112-2<sup>nd</sup> claim rejection.

As discussed earlier, this Application is a **371/PCT/EP04/08229**. **Four IDS** (total 14 pages) are filed so far. **Claims 1-18, 20-21 and 28-52 with a total of seven independent claims (Claims 1, 43-45, 48-49 and 52) are now pending.** An action follows. See no international search report for Applicants’ priority paper **WO 2005/011039 A2 to Calundann et al.** for PCT/EP2004/008229.

3. Claim rejections under **Non-Final** Office Action filed on October 30, 2009 are now removed for the reasons given in paragraphs 4-13 thereafter.

***Allowable Subject Matter***

4. Claims **1-18, 20-21 and 28-52** are allowed.

5. The following is an examiner's statement of reasons for allowance: The above Claims **1-18, 20-21 and 28-52** are allowed over the closest references:



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6. The limitation of “**once-amended**” parent **Claim 1** in present invention relates to a ***proton-conducting polymer membrane based on polyazoles***, obtained by a process comprising ***seven*** steps as:

(A) ***mixing*** one or more ***aromatic tetraamino compounds*** having a high phosphoric acid affinity or low phosphoric acid affinity ***with*** one or more ***aromatic carboxylic acids or esters*** thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, ***or*** one or more ***aromatic and/or heteroaromatic diaminocarboxylic acids*** having a high phosphoric acid affinity, ***in polyphosphoric acid to form a solution and/or dispersion;***

(B) ***heating*** the mixture from step (A), preferably under inert gas, ***and polymerizing until an intrinsic viscosity of up to 1.5 dug***, preferably from 0.3 to 1.0 dug, in particular from 0.5 to 0.8 dug, is obtained to form a polymer whose phosphoric acid affinity is greater than the phosphoric acid affinity of the polymer formed in step (D);

(C) ***mixing*** one or more ***aromatic tetraamino compounds*** having a high phosphoric acid affinity or low phosphoric acid affinity with one or more ***aromatic carboxylic acids or esters*** thereof which contain at least two acid groups per carboxylic acid monomer which have a high phosphoric acid affinity or low phosphoric acid affinity, ***in polyphosphoric acid to form a solution and/or dispersion;***

(D) ***heating*** the mixture from step (C), preferably under inert gas, ***and polymerizing until an intrinsic viscosity of up to 1.5 dl/g***, preferably from 0.3 to 1.0 dl/g, in particular from 0.5 to

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*0.8 dl/g, is obtained to form a polymer whose phosphoric acid affinity is less than the phosphoric acid affinity of the polymer formed in step (B);*

*(E) **combining the polymer from step (B) and the polymer from step (D)**, the phosphoric acid affinity of the polymer from step (B) being **greater than** the phosphoric acid affinity of the polymer from step (D);*

*(F) **forming a layer** by applying the mixture obtained in step (E) on a carrier or on an electrode;*

*(G) **heating** the layer obtained according to step (F), until an intrinsic viscosity of more than 1.5 dl/g is attained **to form a polyazole block copolymer membrane**; and*

*(H) **partially hydrolyzing the polyphosphoric acid in the membrane** formed in step (G) **until it is self-supporting**, thereby forming the proton-conducting polymer membrane.*

Six newly added independent claims (**Claims 43-45, 48-49 and 52**) relate to parent Claim 1 but with some modification. (See support on pages 31-32 of Remarks)

*See other limitations of dependent **Claims 2-18, 20-21 and 28-42, 46-47 and 50-51.***

7. **Seven independent claims are now involved.** Applicant has now claimed in “once-amended” parent **Claim 1** an unexpected way of obtaining some proton-conducting polymer membranes. The product according to parent **Claim 1** is an acid-doped proton-conducting polymer membrane, which is made by a process comprising **eight steps (A)-(H)**.

8. The key point is that **two different polyazoles (made from A/B and C/D) are separately prepared in polyphosphoric acid and then combined.** The phosphoric acid affinity of the polymer from step (B) is intentionally prepared and pre-determined so as to be **greater than the phosphoric acid affinity of the polymer from step (D).** Open language “comprising” is applied to the process used in parent Claim 1. **Six** newly added independent claims (**Claims 43-45, 48-49 and 52**) relate to parent Claim 1 but with some modification (see support on pages **31-32** of Remarks). Previous 102/103 rejections cannot stand as follows:

9. All the process used by references in the art cannot teach or suggest such a sequence of eight steps (A)-(H). As exactly pointed out by Applicants on page 35 at top of Remarks, **Guth does not teach a “block” type polyazole copolymer** as instantly claimed. **In some cases, Guth only uses a mixture of two different polyazoles as starting material for step (A)** so as to prepare acid-doped membrane. The same problem can be applied to **Sakaguchi** reference, even in view of **two** secondary references including **Narang and Guth**.

10. In order to be totally distinguisher over the prior art, Applicants have presented unexpected results such as high conductivity and improved mechanical properties by using such a block polymer with the blocks having different and predetermined phosphoric acid affinities. See page 35 at bottom of Remarks and paragraph 0082.

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11. It is noted by this Examiner even the same sub-steps and/or the same components are used, the resulted products will be different since every step may be critical. Using **a modified block type polyazole copolymer with the blocks having different and predetermined phosphoric acid affinities** is indeed a good conceptual example. Therefore, this invention is novel and not obvious. The references in combination or alone cannot disclose or suggest such a process of making a proton-conducting polymer membrane as discussed above.

12. After further examination and search, the examiner found the following prior art did not teach the claimed limitation: **US 2007/0292734 A1 to Kiefer** et al. has disclosed a process for producing a proton conducting electrolyte membrane for fuel cell application. It is achieved by **irradiating a polymer film and then “graft”-polymerized a vinylphosphonic acid monomer.**

See abstract, line 1-5; Claim 1 at page 16. Its earliest priority date is **May 10, 2002**.

However, Kiefer does not disclose or suggest using a mixture of two different polyazoles for making modified block copolymer. Therefore, Kiefer cannot teach or suggest the membrane limitation of parent claims.

13. As of the date of this office action, the examiner has not located or identified any reference that can be used singularly or in combination with another reference including the above references to render the present invention anticipated or obvious to one of the ordinary skill in the art. Therefore, the **seven** independent claims including **Claims 1, 43-45, 48-49 and 52** are allowed for the reason listed above. Since the prior art of record fails to teach the

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present invention, the remaining pending dependent **Claims 2-18, 20-21 and 28-42, 46-47 and 50-51** are passed to issue.

14. Any inquiry concerning this communication or earlier communication from the examiner should be directed to **Dr. Henry S. Hu whose telephone number is (571) 272-1103**. The examiner can be reached on Monday through Friday from 9:00 AM –5:00 PM. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dr. Vasu Jagannathan, can be reached on (571) 272-1119. The **fax** number for the organization where this application or proceeding is assigned is **(571) 273-8300** for all regular communications. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Peter D. Mulcahy/  
Primary Examiner, Art Unit 1796

/Henry S. Hu/  
Examiner, Art Unit 1796

June 10, 2010